

**WHAT IS CLAIMED IS:**

1. A multi-hop communication system configured by a radio control station connected to a core network and radio stations that relay a signal transmitted from other radio station, wherein,  
5 the radio control station comprises:
  - a control signal transmission/reception unit configured to transmit/receive a control signal for conducting communication with the radio station;
- 10 an information signal transmission/reception unit configured to transmit/receive an information signal; and  
a communication route determiner configured to determine a communication route for the control signal and a communication route for the information signal by different independent processes, and the radio station comprises:
  - a control signal transmission/reception unit configured to transmit/receive the control signal; and
  - an information signal transmission/reception unit configured to transmit/receive the information signal.
- 20 2. A multi-hop communication system configured by a radio control station connected to a core network and radio stations that relay a signal transmitted from other radio station, wherein,  
the radio control station comprises:
  - a control signal transmission/reception unit configured to transmit/receive a control signal for conducting communication with the radio station;
  - an information signal transmission/reception unit

configured to transmit/receive an information signal; and  
a communication route determiner configured to determine  
a communication route for the control signal by a different  
independent process from determination of a communication route  
5 for the information signal, and the radio station comprising:  
a control signal transmission/reception unit configured  
to transmit/receive the control signal; and  
an information signal transmission/reception unit  
configured to transmit/receive the information signal.

10 3. A radio control station connected to a core network and  
controls communication by a radio station that relays a signals  
transmitted by other radio station, comprises:  
a control signal transmission/reception unit configured  
to transmit/receive a control signal for conducting  
15 communication with the radio station;  
an information signal transmission/reception unit  
configured to transmit/receive an information signal; and  
a communication route determiner configured to determine  
a communication route for the control signal.

20 4. A radio control station according to claim 3, the  
communication route determiner determines a communication route  
for the information signal by a different independent process  
from the determination of the communication route for the control  
signal.

25 5. A radio control station according to claim 3, the  
communication route determiner transmits a communication route  
acquisition request to the radio station for acquisition of a

communication route, and the communication route determiner determines a communication route based on a response to the communication route acquisition request transmitted by the radio station.

5 6. A radio control station according to claim 3, further comprising a communication channel controller configured to transmit a usage notification that indicates usage of a communication channel handled by the radio control station.

7. A radio control station according to claim 3, the  
10 communication route determiner determines a communication route to the radio station and transmits a communication route determination notification that notifies the communication route to a radio station located on the communication route.

8. A radio control station according to claim 7, the  
15 communication route determiner assigns a communication channel to be used in the radio station located on the determined communication route.

9. A radio station conducting communication via a radio control station connected to a core network, comprising:

20 a control signal transmission/reception unit configured to transmit/receive the control signal;

an information signal transmission/reception unit configured to transmit/receive the information signal; and

25 a communication route determiner configured to determine a communication route for the control signal and a communication route for the information signal by different independent processes.

10. A radio station according to claim 9, the communication route determiner transmits a usage inquiry to the radio station for inquiring usage of a communication channel handled by the radio control station and transmits/receives the information  
5 signal according to a usage notification that is a response to the usage inquiry.

11. A radio station according to claim 9, further comprising a decision unit configured to decide whether or not communication is directly conducted with the radio control station based on  
10 a reception level of the control signal received by the control signal transmission/reception unit.

12. A radio station according to claim 11, the decision unit changes a threshold for the reception level according to a transmission speed of the information signal and to decide  
15 whether or not communication is directly conducted with the radio control station based on a result of comparison of the reception level and the threshold.

13. A radio station according to claim 9, further comprising a first relay controller configured to transmit a relay control  
20 signal to other station for requesting a relay of the information signal and to set a communication route to the radio control station via the other station according to a response relay control signal that is a response to the relay control signal.

14. A radio station according to claim 13, further comprising  
25 a communication route selector configured to select a radio station satisfying a prescribed condition regarding a communication state if a plurality of the other radio station

transmitted the response relay control signal.

15. A radio station according to claim 9, further comprising  
a second relay controller configured to receive a relay control  
signal requesting a relay of the information signal from other  
5 station, to transmit a response relay control signal that is  
a response to the relay control signal and to set a communication  
route from the other radio station to the radio control station.

16. A radio station according to claim 15, the second relay  
controller transmits the response relay control signal notifying  
10 ability of the relay of the information signal based on a reception  
level of the received response relay control signal.

17. A radio station according to claim 14, wherein an  
information indicating a number of hops from the other radio  
station to the radio control station is included in the response  
15 relay control signal, and the communication route selector  
selects a radio station based the number of hops included in  
the response relay control signal.

18. A radio station according to claim 14, wherein an  
information indicating an interference level is included in the  
20 response relay control signal, and the communication route  
selector selects a radio station based the interference level  
included in the response relay control signal.

19. A multi-hop communication method used in a system  
configured by a radio control station connected to a core network  
25 and radio stations that relay a signal transmitted from other  
radio station, comprising:

a usage inquiry step that the radio station transmits a

usage inquiry for inquiring usage of a communication channel handled by the radio control station using a control signal for conducting communication with the radio control station;

5 a communication route determination step that the radio control station determines a communication route for the control signal and a communication route for the information signal by different independent processes;

10 a usage notification step that the radio control station transmits a usage notification indicating usage of the communication channel handled by the radio control station; and

an information signal transmission step that the radio station and the radio control station transmit/receive the information signal using the communication route according to the usage notification.